Title.....: Acute cardiovascular responses during resistance exercise: comparison between Chronic Heart Failure Patients, Healthy Age Matched and Young
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Introduction
Acute hemodynamic responses during resistance efforts are not well characterized. The aim of the present project was to characterize such responses during lower limb resistance exercise, in different populations.

Methods
Experiments were performed on: 8 Healthy Young Subjects (HYS, 25±5 yrs), 12 Chronic Heart Failure Patients (CHF, 66±5 yrs), 8 age-matched Healthy Elderly (HES, 66±4 yrs). All subjects were equipped with a Portapres device on a finger of a free hand. We analyzed: pressure values (systolic SAP and diastolic DAP), heart rate (HR), stroke volume (SV), cardiac output (CO) and total peripheral resistance (TPR) (by Modelflow algorithm). All subjects performed a 1RM indirect test (Brzycki method) to determine the individual maximal dynamic force in kg, useful to calculate the loads used during the strength test (70% 1RM); sessions were divided into a warm-up phase (jogging) and a test phase, which lasted about 1 hour and was performed according to the formula of 2 series (10 minute recovery between series) of 12 repetitions (each repetition lasting about 5 sec). Continuous measurements were obtained at base level, during the entire exercise and into 2 minutes of recovery. Three way anova statistical analysis was performed.

Results
Averaged results of the two series are reported at control, at peak changes during exercise and 20 seconds after the exercise:
HYS: SAP 140-200-158; DAP 70-105-70; HR 90-133-110; SV 105-98-110; CO 9-12.5-12; TPR 0.6-0.6-0.5.
HES: SAP 163-228-180; DAP 74-108-71; HR 84-115-108; SV 92-65-97; CO 8-7-10; TPR 0.91-1.35-0.64.
CHF: SAP 127-162-129; DAP 63-86-56; HR 69-90-83; SV 91-67-102; CO 6-5-8; TPR 0.91-1.36-0.63.

Discussion
In all groups cardiovascular adaptations during and after resistance exercise appeared adequate. Systolic and diastolic pressures were higher in HES than in HYS; in CHF they were pharmacologically controlled. b-blockade reduced HR in CHF, but HR was also lower in HES than HYS at peak exercise. TPR did not change from base in HYS, while it rose in HES and CHF, probably as an effect of an impaired microcirculatory adaptation at the active muscle level. As a consequence the overall cardiovascular response was different in young versus elderly subjects: SV decreased at peak and increased during recovery in CHF and HES, but did not change in HYS at any phase; CO decreased slightly in HES and more so in CHF during exercise, and rebounded at recovery. In HYS CO increased at peak and declined after the effort. The difference in SV response between CHF/HES versus HYS probably represents an age-factor, depending on TPR (unchanged in HYS). It does not seem to be related to heart failure (CHF behave like HES).

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